Claims:

What is claimed:

1. A large area metallization pretreatment and surface activation system, comprising:

(a) a gas or gas mixture;

(b) an electron beam source;

(c) a low electron plasma of pre-determined width, length, thickness, and location relative to a surface, wherein the plasma sheet is produced by the electron beam passing through the gas or gas mixture;

(d) a substrate to be treated;

wherein the radical and ion flux from the plasma is controlled to chemically and physically alter the surface of the substrate thereby improving the ability of a film to adhere to the substrate;

wherein the radical and ion flux from the plasma is controlled by selecting an appropriate gas mixture based on the desired surface pretreatment and by altering the separation between the plasma sheet and the substrate.

2. The system of claim 1, wherein said electron beam source has a width much larger in dimension than its thickness.

3. The system of claim 1, additionally comprising magnetic means for confining the electron beam to produce a geometrically well-defined, spatially uniform plasma sheet.

4. The system of claim 1, wherein the relative position of said electron beam, plasma, and substrate is adjustable.

5. The system of claim 1, wherein said substrate is electrically biased.

6. The system of claim 1, wherein said gas or gas mixture comprises at least one molecular gas chosen to produce a specific radical species.

7. The system of claim 1, additionally comprising roll-to-roll spools to feed the substrate.

8. The system of claim 1, additionally comprising:

(a) a second gas or gas mixture; and

(b) a target comprising a material source for thin films or coatings

wherein plasma is used with the second gas or gas mixture to sputter material from the target and deposit as a thin film or coating the sputtered material onto the pretreated substrate.

9. The system of claim 8, wherein said target is electrically biased above a sputtering threshold for said material source.

10. The system of claim 8, wherein said electron beam and said plasma are located between the target and the substrate.

11. The system of claim 8, wherein the relative position of said electron beam, plasma, target, and substrate is adjustable.

12. The system of claim 8, wherein said second gas is selected from the group consisting of atomic or molecular gases or mixtures thereof.

13. The system of claim 8, additionally comprising roll-to-roll spools to feed the substrate.

14. The system of claim 1, additionally comprising a conventional plasma vapor deposition system for generating material for coating or deposition on the pretreated substrate, said material being generated from a material source by sputtering means or vaporization means.

15. The system of claim 14, wherein said sputtering means is selected from the group consisting of magnetrons and ion beams.

16. The system of claim 14, wherein, said vaporization means is selected from the group consisting of electron beams, lasers, and thermal sources.

17. The system of claim 14, wherein said electron beam and said plasma are located between said source material and said substrate.

18. The system of claim 14, wherein the relative position of said electron beam, plasma, source material, and substrate is adjustable.

19. A method of producing a chemically active surface to improve the ability of a film to adhere to a substrate, comprising the steps of:

(a) producing a low electron plasma of pre-determined width, length, thickness, and location relative to a surface by passing an electron beam through a gas or gas mixture; and

(b) controlling the radical and ion flux from the plasma to chemically and physically alter the surface of a substrate thereby improving the ability of a film to adhere to the substrate;

wherein the radical and ion flux from the plasma is controlled by selecting an appropriate gas mixture based on the desired surface pretreatment and by altering the separation between the plasma and the substrate.

20. The method of claim 19, wherein said electron beam has a width much larger in dimension than its thickness.

21. The method of claim 19, additionally comprising applying a magnetic field for confining the electron beam to produce a geometrically well-defined, spatially uniform plasma sheet.

22. The method of claim 19, wherein the relative position of said electron beam, plasma, and substrate is adjustable.

23. The method of claim 19, wherein said substrate is electrically biased.

24. The method of claim 19, wherein said gas or gas mixture comprises at least one molecular gas chosen to produce a specific radical species.

25. The method of claim 19, additionally comprising roll-to-roll spools to feed the substrate.

26. The method of claim 19, additionally comprising:

using a second gas or gas mixture with the electron beam generated plasma to sputter material from a target and deposit as a thin film or coating the sputtered material onto the pretreated substrate.

27. The method of claim 26, wherein said target is electrically biased above a sputtering threshold for said material source.

28. The method of claim 26, wherein said electron beam and plasma are located between the target and the substrate.

29. The method of claim 26, wherein the relative position of said electron beam, plasma, target, and substrate is adjustable.

30. The method of claim 26, wherein said second gas is selected from the group consisting of atomic or molecular gases or mixtures thereof.

31. The method of claim 26, additionally comprising using roll-to-roll spools to feed the substrate.

32. The method of claim 19, additionally comprising using a conventional plasma vapor deposition system for generating material for coating or deposition on the pretreated substrate, said material being generated from a material source by sputtering means or vaporization means.

33. The method of claim 32, wherein said sputtering means is selected from the group consisting of magnetrons and ion beams.

34. The method of claim 32, wherein, said vaporization means is selected from the group consisting of electron beams, lasers, and thermal sources.

35. The method of claim 32, wherein said plasma is located between said source material and said substrate.

36. The method of claim 32, wherein the relative position of said electron beam, plasma, source material, and substrate is adjustable.